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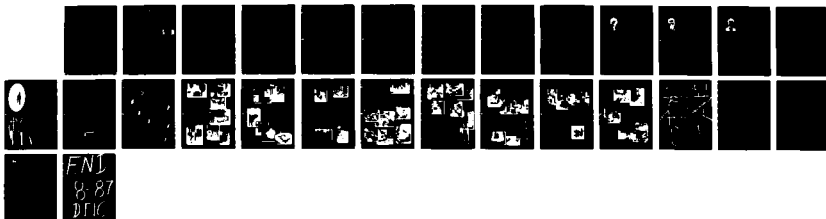
CONSTRUCTION QUALITY ASSURANCE PLAN FOR THE EAST COAST
AIR COMBAT MANEUVE. (U) CREST ENGINEERING INC TULSA OK
MAR 77 T-771-021 CHES/NAVFAC-FPD-7633 N62477-76-C-0179

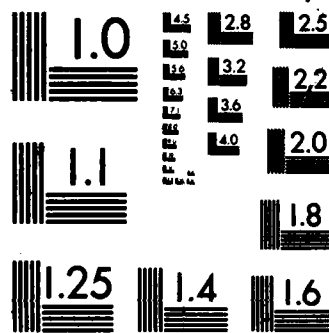
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A182 560

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Comments transmitted
to McCann on 1 Apr 77
by Mayer & Ling.

CONSTRUCTION QUALITY ASSURANCE PLAN

FOR THE

EAST COAST AIR COMBAT MANEUVERING RANGE

OFFSHORE KITTY HAWK, NORTH CAROLINA

CONTRACT NO. N62477-76-C-0179 MOD. NO. P0002

REPORT NO. T-771-021

Prepared for

NAVAL FACILITIES ENGINEERING COMMAND
DEPARTMENT OF THE NAVY
CHESAPEAKE DIVISION

DISTRIBUTION STATEMENT A

Approved for public release
Distribution Unlimited

By

CREST ENGINEERING, INC.
TULSA, OKLAHOMA

March 1977

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ELECTE
JUL 10 1987
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Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENT

AD-A182 560

1a. REPORT SECURITY CLASSIFICATION

1b

RESTRICTIVE MARKINGS

Unclassified

2a. SECURITY CLASSIFICATION AUTHORITY

3. DISTRIBUTION AVAILABILITY OF REP
Distribution unlimited.

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT #
T-771-021

5. MONITORING ORGANIZATION REPORT #
FPO 7633

6a. NAME OF PERFORM. ORG.
Crest Engineering, Inc.

6b. OFFICE SYM

7a. NAME OF MONITORING ORGANIZATION
Ocean Engineering &
Construction Project Office
CHESNAVFACENGCOM

6c. ADDRESS (City, State & Zip)
Tulsa, OK

7b. ADDRESS (City, State, & Zip)
Bldg. 212, Washington Navy Yard
Washington, DC 20374-2121

8a. NAME OF FUNDING ORG.

8b. OFFICE SYM

9. PROCUREMENT INSTRUMENT IDENT #
N62477-76-C-0180

8c. ADDRESS (City, State & Zip)

10. SOURCE OF FUNDING NUMBERS

PROGRAM	PROJECT	TASK	WORD	UNIT
ELEMENT #	#	#	#	ACCESS #

11. TITLE (Including Security Classification)

Construction quality assurance plan the East Coast Air Combat Maneuvering
Range Offshore Kitty Hawk, North Carolina

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT

13b. TIME COVERED

FROM TO

14. DATE OF REP (yy/mm/dd)

77/03

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD GROUP SUB GROUP

18. SUBJECT TERMS

Construction, East Coast Air Combat Maneuvering
Range, North Carolina, Kitty Hawk, NC

19. ABSTRACT (Continue on reverse if necessary & identify by block number)

The development of the East Coast Air Combat Maneuvering Range Offshore Kitty Hawk, North Carolina entails the fabrication, transportation and erection of four ocean structures which, with related equipment, comprise the range. During the construction phase of the project, a quality assurance plan was developed to ensure the proper construction of the range.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ABSTRACT OF THIS REPORT IS AVAILABLE SAME AS REPORT

20a. NAME OF RESPONSIBLE INDIVIDUAL
Jacqueline M. Riley
DD FORM 14-1, 6411AB

20b. TITLE (Include subtitle)
20c. AUTHOR
20d. SUBJECT

BLOCK 19 (con't)

for quality control rests with the Construction Contractor while responsibility for Quality Assurance rests with the Government. Set forth hereinafter is the A&E's plan for supporting the Government in their quality assurance efforts.

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Justification	
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Distribution/	
Availability Codes	
Date	Accession or Serial
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EXHIBIT A	RESUMES
EXHIBIT B	TESTING LABORATORY

CONSTRUCTION QUALITY ASSURANCE PLAN

Plan 1 SCOPE OF REPORT

The development of the East Coast Air Combat Maneuvering Range, offshore Kitty Hawk, North Carolina entails the fabrication, transportation and installation of four ocean structures which, with electronic gear, comprise a portion of the Range. During the construction phase of the project, responsibility for quality control rests with the Construction Contractor while ^{ultimate} responsibility for Quality Assurance rests with the Government. Set forth ^{in this plan} ~~hereinafter~~ is the A&E's ^{responsibility} ~~plan~~ for supporting the Government ~~in their~~ quality assurance efforts ~~the~~.

2 STRUCTURAL DESCRIPTIONS

The four ocean structures are of the same general configuration, triangular in planform but varying in overall height as dictated by the water depths at their respective locations. The structures are of welded steel construction and fabricated in units, each structure consisting of a superstructure, a templet, piling and appurtenances.

The four superstructures are identical each being comprised of two decks of beam/plate construction supported by tubular columns. The columns are laced together with Z-braces occurring immediately below the lower deck, are to extend from the upper deck to the top of the templet and are sufficiently long to place the lower deck well above the crest of the design storm wave. Access to the decks is provided by a stairway from the top of the templet to the upper deck.

The templets are constructed as trussed space-frames having tubular

members and battered faces. Their overall height is such that each exceeds the mean low water depth at their respective sites by a prescribed amount. Each templet is provided with a boatlanding, barge fenders, and walkways. Corrosion protection is provided by a combination of painting, excess material and sacrificial anodes.

Each templet is afixed to the ocean floor by means of piling driven through the templet columns into the ocean floor and subsequently attached to the top of the jacket by welding.

All instrumentation and aids to navigation mounted on the structures are to be furnished by the Government. Jib cranes with winch and chain hoists are to be provided by the Contractor for each platform.

QUALITY ASSURANCE

The objective of quality assurance is to ascertain that construction activities are being conducted in accordance with project specifications. Two of the ways in which this objective may be attained are to monitor randomly the quality control efforts of the construction contractor or alternately to conduct a random inspection activity independent of the contractor quality control. For this project, both approaches will be employed but with the major emphasis placed on the former.

In keeping with the above, the primary ^{responsibility} ~~function~~ of quality assurance personnel for this project shall be to observe the quality control and construction activities of the contractor and subsequently report those observations to the Resident Officer in Charge of Construction (ROICC). With this approach, the overall project will be monitored continually for

Quantify or
define

conformance to specification by observing randomly the various tests and inspections of the Contractor's Quality Control (CQC) organization. The CQC documentation of those tests and inspections will be compared to reported observation for their substantiation.

With regard to independent inspection activities, these generally will be restricted to visual inspections including but not limited to joint preparation, member fit-up, welds, welding materials, welding procedures, blast-cleaned surfaces and painting methods. Non-destructive testing of materials shall be restricted to ultrasonic testing and that shall be conducted only at the express request of the RIOCC.

No!
John you
indicates
what is
required

Destructive testing is ~~outside the scope of this contract~~ but will be provided on written order at rates published (Exhibit B) plus 10%. Destructive testing will be conducted by Midstates Analytical Laboratories, Inc., Tulsa, Oklahoma.

4. SUPPORT PERSONNEL

During construction of the ACMR platforms, a construction engineer and a welding inspector shall be stationed initially at the fabrication facility and later at the installation sites offshore. Resumes for these individuals are displayed in Exhibit A.

4.1 Construction Engineer

The construction engineer, as the on-site representative of the A&E, shall provide support to Government personnel ~~in accordance with~~ ^{as required to} ~~on a fulltime basis~~ ^{effect} ~~responsibilities~~ ^{the provisions of} ~~His duties~~ ^{- this plan.} shall include, but not be limited to, the following:

- ... ~~Carry out this inspection plan~~
- ... Appraisal of all construction activities and equipment with particular attention to lifting and handling apparatus.

- ... Assessment of the Construction Contractors project organization, planning, schedules and records.
- ... Evaluation of the Construction Contractor's supervisory personnel.
- ... Maintenance of a record of deficiencies in the Construction Contractor's execution of the work and notification of the ROICC thereof and of the ultimate disposition.
- ... Appraisal of requested variations in the work and authorization of those deemed acceptable. -*
- ... Observation of the Construction Contractors material procurement, handling, storage and tracing procedures.
- ... Monthly estimation of construction progress.
- ... Verification of load-out list by examination of cargo.
- ... Maintenance of a diary of events and milestones.
- ... Maintenance of a time/per diem log.

Recommend additional reqmts as needed for destructive & non-destructive testing responsibilities

4.2 Welding Inspector

The welding inspector's ~~duties~~ shall include, but not be limited, to the following:

- Carry out this inspection plan*
- ... Observance of all CQC activities.
 - ... Surveillance of welders (^{100 to 200} ~~some thirty to fifty in number~~) to ascertain that those assigned to the project are qualified and to see that they use only approved procedures.
 - ... Inspection of materials for defects and to assure compliance with specifications.
 - ... Examination of joint preparation, fit-up and welding.
 - ... Verification of member lengths and other dimensions.
 - ... Examination of test specimens and test records, both X-ray and ultrasonic.
 - ... Inspection of repairs of defects.
 - ... Verify that member splice locations comply with the specifications.

Submit

C-E CREST

R. Dale MacCallum



Design Engineer -- Offshore Section

<u>University</u>	<u>Degree</u>	<u>Year</u>
University of Kansas	Bachelor of Science Architectural Engineering	1964

Experience:

1975 to Present

Design
Engineer

C-E Crest

Served as Civil Field Engineer on oil terminal and pipeline project overseas. Responsible for coordination with contractors, checking material status, and quality control for civil work.

1970 to 1975

Engineering
Manager

Allied Steel Products Corporation

Responsible for management of engineering personnel for structural steel fabricator and metal building fabricator and erector. Responsible for design of all products produced. Supervised field installation of new design concepts. Initiated and supervised estimating system. Developed from initial stage complete computer department including engineering, estimating and accounting programs.

1969 to 1970

Structural
Engineer

Sullivan Engineering Company

Responsible for structural design of high rise office buildings up to 27 stories, schools, shopping centers and apartments. Involved in liaison and coordination with client architects.

C-E CREST



Ronald L. Collins

Inspection Department

Education

Year

Spartan School of Aeronautics

1972

Spartan School of Non-Destructive Testing

1972

Magnaflux School - ASME Nuclear Codes

1973

Societies and Licenses:

Member ASNT Tulsa Branch

ASNT Level II in Radiography, Ultrasonics, Eddy Current,
Magnetic Particle, and Liquid Penetrant Inspection.

Air Frame and Power Plant Certified Mechanic,
Private pilot.

Specification - Interpretation

ASME Boiler Code, Sec. V and VIII

API 1104

B33.1

AWS D1.1

Experience:

1975 to Present

Inspector

C-E Crest

Responsible for the inspection of equipment and materials
in plants of suppliers to verify that established specifica-
tions, codes, and standards are satisfied. Establishes
levels of quality control and collaborates with engineer-
ing in establishing and maintaining schedules of inspec-
tion. Experienced in supervising inspection in the U.S.A.
and abroad.

1972 to 1975

Instructor

Spartan School of Non-Destructive Testing

Instructor of Non-Destructive Testing in all phases of the
field to include: X-Ray and Gamma Radiography,
Ultrasonics, Eddy Current, Penetrant, Magnetic Particle,
Radiological Safety, and Film Interpretation.

2/7/77

C-E CREST



Wm. R. Walin (Bill)

Inspection Department

College

Year

De Anza Junior College

1968

Societies and
Licenses:

Nondestructive Testing
State of California Department of Health to Operate
Radiographic Isotopes up to 500 curies of Cobalt No. 60
Army and Air Force Licenses Qualifying X-Ray and
Magnetic Particle Inspection
Certified ASNT Level III Examiner in Radiography,
Ultrasonic, Penetrant and Magnetic Particle
Certified Nav-ships 250-1500-1 Radiography, Ultrasonic,
Penetrant and Magnetic Particle

Specification
Interpretation:

ASME Boiler Code, Section 8
Navships 250-692-2
250-692-13
250-1500
271
MIL-R-11468
B 33.1
API 1104

Experience:

1970 to Present

Inspector

C-E Crest

Responsible for the inspection of equipment and materials in plants of suppliers to verify that established specifications, codes and/or standards are satisfied. Collaborates with engineering in establishing and maintaining schedules for inspection of products. Establishes levels of quality control.

C-E CREST

Wm. R. Walin (Bill)

Inspection Department

Experience Continued:

Reviews quality control of suppliers and prospective suppliers. Assists in expediting during plant visits.

1969 to 1970

C-E Crest

Expediting
and
Inspection

Inspector - Visual inspection and radiographic inspection in Libya, South Africa and U.S.A. Expediting work.

1968 to 1969

McDonald-Douglas Aircraft Company

Inspector

Ultrasonic Inspector. Duties included ultrasonic inspection of all material received and corrosion check for aircraft. Penetrant inspection.

1968 to 1969

United States Testing Laboratories

Inspector

Nondestructive Testing Supervisor and safety officer. Duties included radiography, ultrasonics and magnetic particle inspection. Bidding on contracts.

1965 to 1968

Westinghouse Electric Corporation

Radiographer

Duties include radiography, drawing shooting sketches for castings, film interpretation.

1964 to 1965

Inland Analytical Testing Laboratories

Radiographer

Company representative in charge of radiographic and film interpretation.

1960 to 1964

Pittsburgh Testing Laboratories

Radiographer

Duties included radiography, magnetic particle inspection, dye penetration, structural steel inspection, bidding X-Ray and inspection jobs, general lab work which included concrete inspection (nondestructive) and tensile test and welder qualification tests. Radiography and film interpretation.

12/31/76



MIDSTATES

ANALYTICAL LABORATORIES

TULSA, OKLAHOMA



MIDSTATES

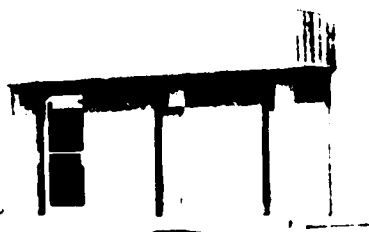
ANALYTICAL LABORATORIES

One of the most modern and complete independent commercial testing laboratories in the Southwest, Midstates is prepared and equipped to efficiently perform a wide variety of laboratory tests to serve the industrial community.

Specializing in the chemical, mechanical and metallurgical evaluation of metals and alloys, a wide range of services are offered to producers, fabricators, and users. All testing is performed in accordance with ASTM, ASME, API, Military, Federal, or individual customer specifications.

Dedicated to providing efficient, accurate and reliable service, Midstates maintains a professional staff of engineering, scientific and technical personnel to provide prompt and continual assistance with your technical problems. Elapsed time from receipt of samples to completion of testing is kept to a minimum.

We are proud of our facilities and personnel and welcome consideration for your testing needs.



5460 S. 101st E. Avenue Tulsa, Oklahoma 74145
918 622-6030

KEY PERSONNEL



WILLIAM A. VESELY PRESIDENT

B. S. Degree in Metallurgical Engineering with 13 years' related experience, primarily in the area of materials testing.



HOWARD T. THORNHILL

M. S. Chemistry with 12 years' experience as Analytical Chemist, Foundry Metallurgist, Ass't Foundry Manager and chemistry and physics teacher.

BETTY JOYCE

Graduate of Draughons Business College with 20 years' experience in all phases of secretarial work, accounting, purchasing and technical report publication



ROGER W. WOOD
33 years' general machine shop experience, with 20 years as Job Shop Foreman.

ZANE MC CULLEY

B. S. Degree in Chemistry with 16 years' experience in analytical chemistry in inorganic analysis, primarily metals, alloys, and water analysis, using both wet and instrumental methods.



LARRY PATE

12 years of experience in mechanical and metallurgical testing, including two years as Quality Control Supervisor.

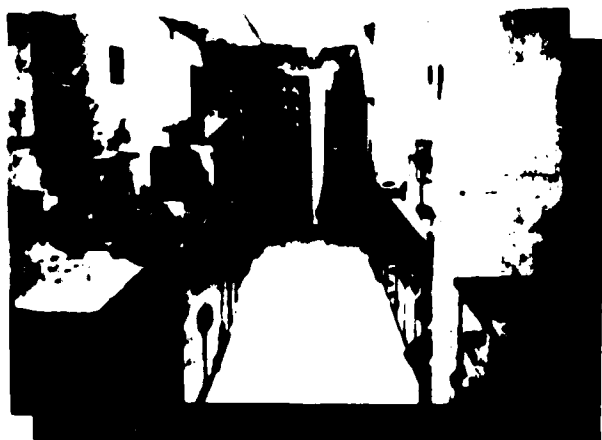


FRANCIS ZIGMUND
M. S. Chemistry with 9 years' experience as Analytical chemist in areas of metal analysis, fertilizer, pesticides and herbicides analyses, water analysis and polymer evaluation.

KEITH SIMS

B. S. Degree in Biology, with 6 years' experience as Chemical Technician, Foundry Supervisor, and Air Pollution Enforcement Officer.



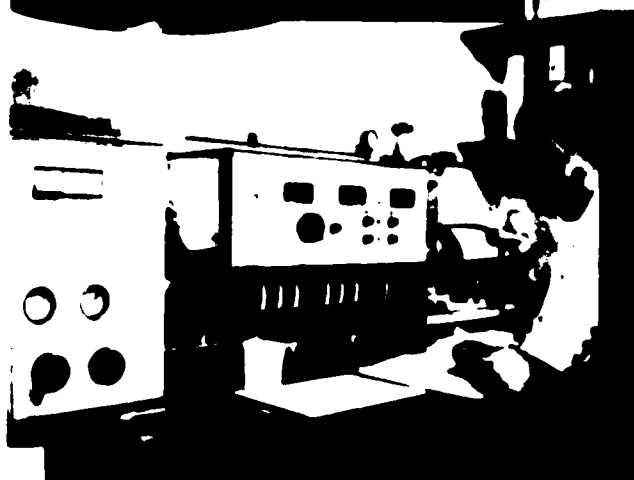


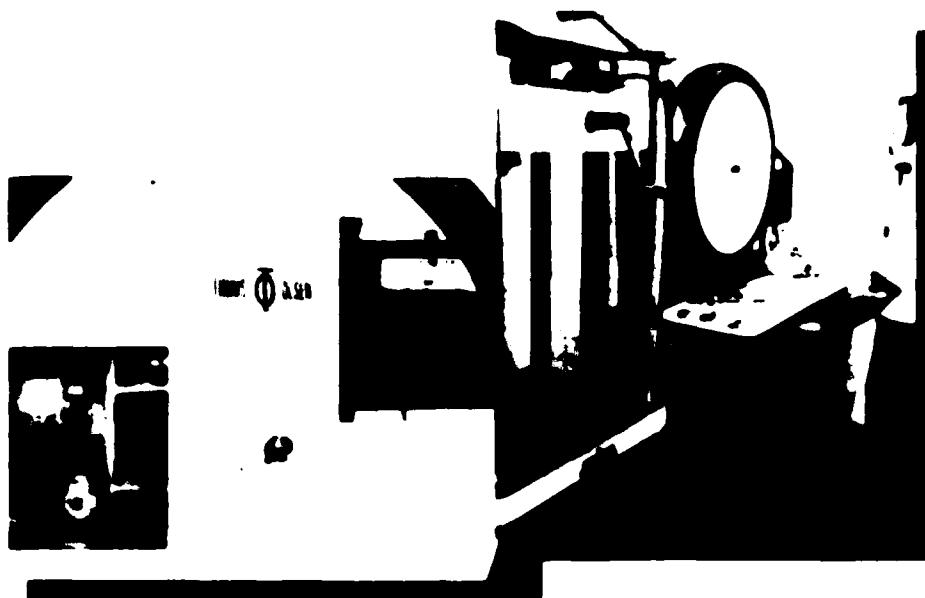
CHEMICAL ANALYSIS

Facilities and personnel are available for performing chemical analysis of a variety of materials, utilizing both the classical "wet" methods (such as gravimetric, volumetric and colorimetric) as well as instrumental methods such as atomic absorption spectroscopy.

The major emphasis is on the analysis of metals and alloys. Materials routinely analyzed in our Laboratory include carbon, low alloy and stainless steels, and other high-alloy ferrous materials, copper-base alloys, nickel-base alloys, aluminum alloys, and lead and tin-base alloys.

Other materials which can be evaluated on either a quantitative or qualitative basis include corrosion products, industrial chemicals, water and waste water, ores and minerals, and a wide variety of industrial and consumer products.

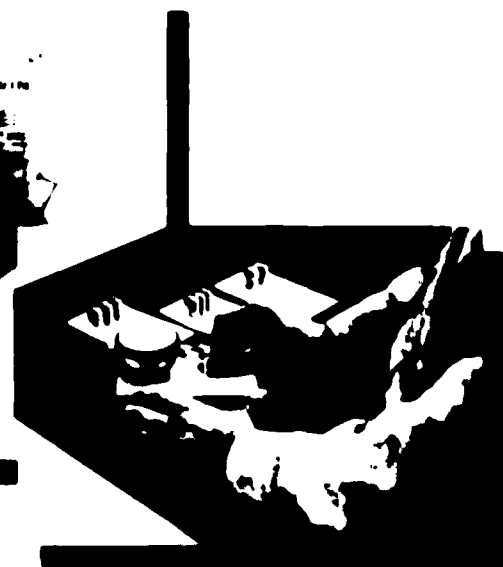




MECHANICAL TESTING

Midstates Laboratories routinely performs a variety of mechanical testing, such as tensile testing, compression testing, bend testing and impact testing for material qualification, welding qualification or in conjunction with failure analysis.

Calibration is maintained as required, on all measuring devices traceable to the National Bureau of Standards. Close control is maintained on all sample identity and in-house sample preparation assures maximum control and accuracy.





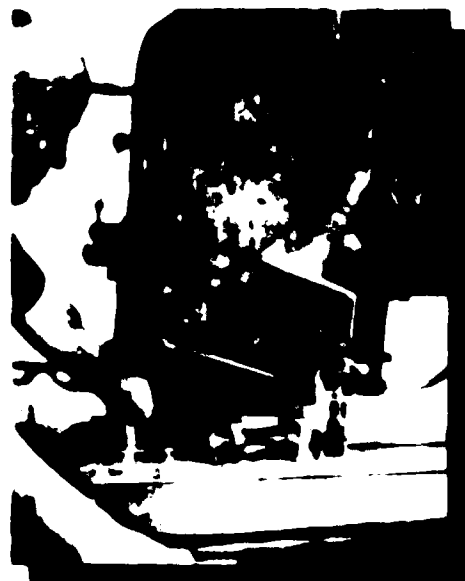
HARDNESS TESTING

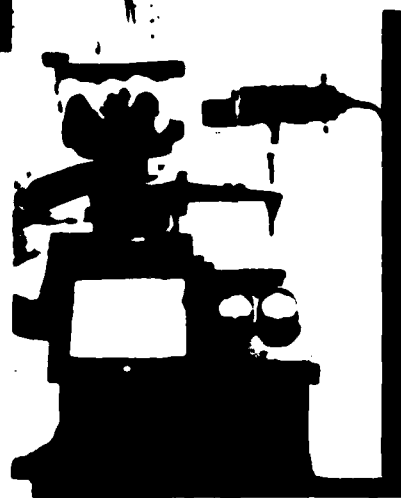
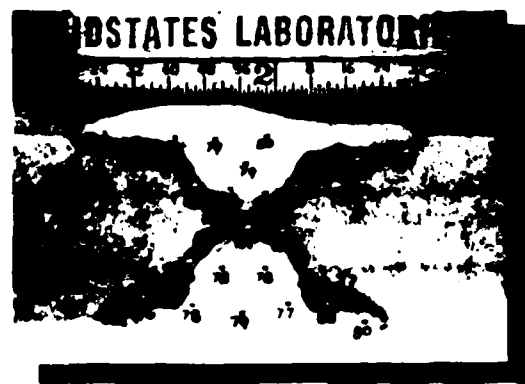
Midstates Laboratories performs hardness testing ranging from field testing using a portable King Brinell Tester or Telebrinell Tester to sophisticated microhardness testing in the laboratory using Vickers Diamond Pyramid hardness or Knoop hardness testing. Complete Rockwell hardness testing, both standard and superficial, is also performed in the laboratory.



SPECIMEN MACHINING

Midstates has complete facilities for machining specimens. Handling capacity to one ton and sawing capacity to twenty inches thickness provides capabilities for removing specimens from a wide variety of sample materials. Numerous mills, lathes and grinders assure expeditious processing, but the most important aspect of this operation is the rigid control of sample identity and the rigid quality control system by which the shop is operated. Accuracy is assured by elaborate gaging equipment, including a thirty-inch J and L Optical Comparator.





METALLOGRAPHY AND PHOTOGRAPHY

The following information is for the purpose of providing a general overview of the services provided by the Federal Bureau of Investigation, United States Laboratory, in the field of Metallography and Photography. The information is not intended to be a comprehensive guide to the services provided, but rather a general overview of the types of services available. For more detailed information, please contact the Federal Bureau of Investigation, United States Laboratory, at the address listed below.

The Federal Bureau of Investigation, United States Laboratory, provides a wide range of services in the field of Metallography and Photography. These services include the examination and analysis of metal specimens, the preparation of metallographic specimens, the photography of metallographic specimens, and the interpretation of metallographic photographs. The laboratory is equipped with the latest in metallographic and photographic equipment, and has a staff of highly trained and experienced professionals who are capable of providing the highest quality of service to our clients.

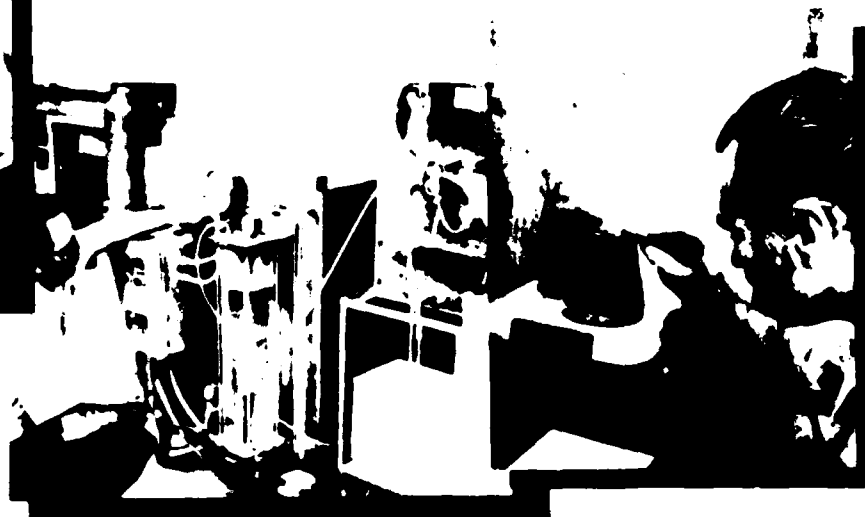
The Federal Bureau of Investigation, United States Laboratory, is a leading authority in the field of Metallography and Photography, and is recognized by the American Society for Nondestructive Testing (ASNT) as a leading provider of nondestructive testing services. The laboratory is also a member of the International Association of Forensic Scientists (IAFS) and the International Association of Forensic Photographers (IAFP).

If you are interested in learning more about the services provided by the Federal Bureau of Investigation, United States Laboratory, in the field of Metallography and Photography, please contact the laboratory at the address listed below. We will be happy to provide you with the information you need to make an informed decision about whether our services are right for you.



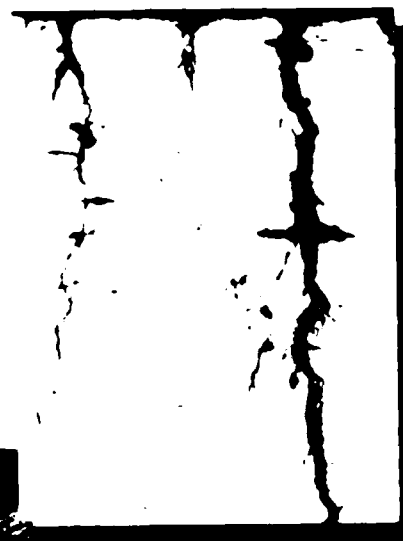
CORROSION TESTING AND EVALUATION

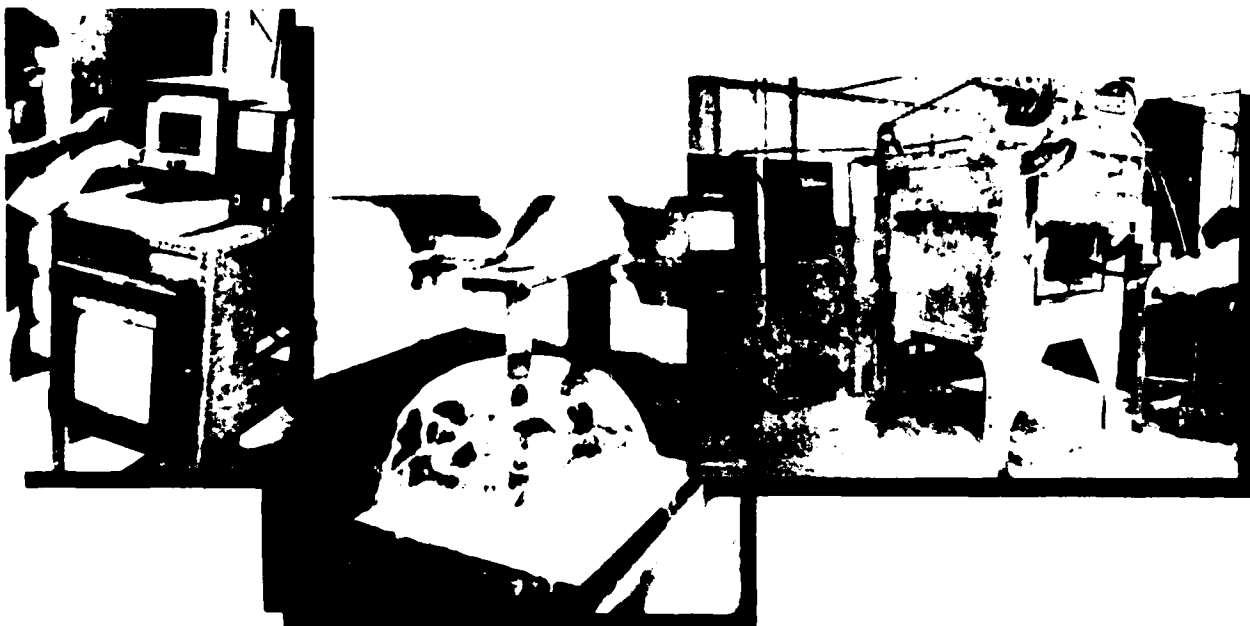
A variety of corrosion testing is performed at Midstates Analytical Laboratories. Salt spray testing, stress corrosion cracking susceptibility and tests for susceptibility to intergranular corrosion such as the Huey test and acidified copper sulfate test are routinely performed.



FAILURE ANALYSIS

Failure analysis, the process of applying knowledge, operation history, test data and observation to identify and correct a failure, is a service provided by Midstates' professional staff.



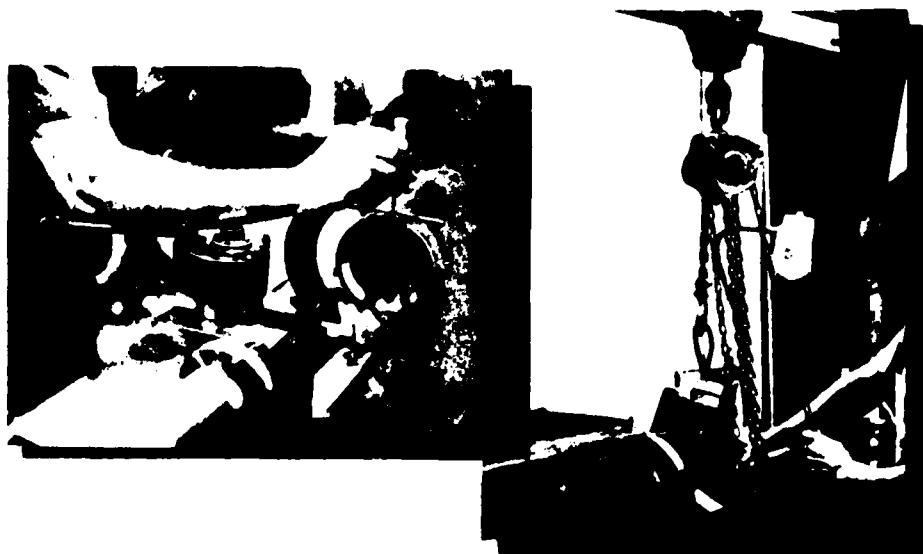


FURNACE AND WELDING FACILITY

Facilities are available for laboratory heat treatment including equipment for programmed control of temperature cycles and associated testing, such as, Jominy hardenability testing.

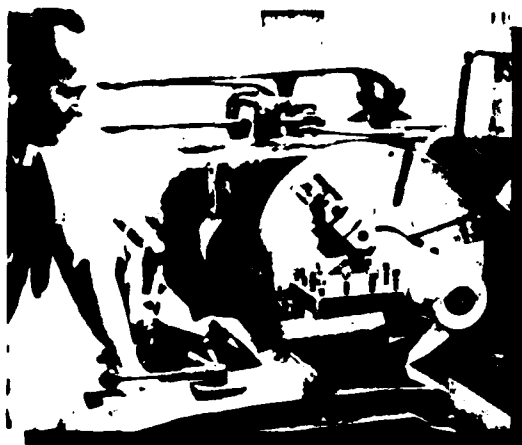
Midstates Laboratories also has a complete facility for welders to make test joints, then on the spot heat treat and ultrasonic inspection for welder certification.

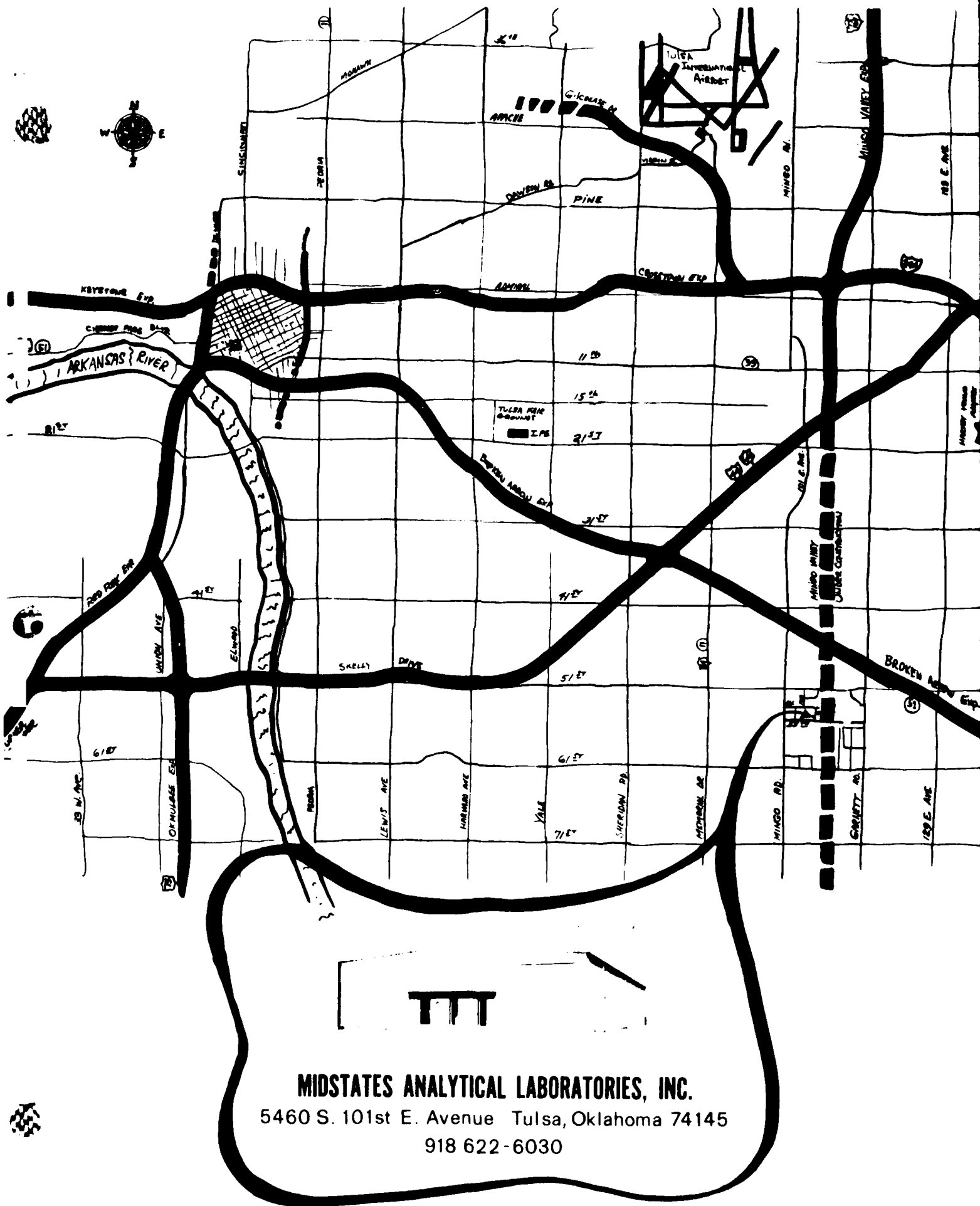




SPECIAL FIXTURE FABRICATION AND MACHINING

A wide range of machine tools are available for fabrication of special test fixtures and test systems and components.





MIDSTATES ANALYTICAL LABORATORIES, INC.

5460 S. 101st E. Avenue Tulsa, Oklahoma 74145

918 622-6030

PRICE LIST

Prices effective January 1, 1976 (Subject to change without notice)

Weld procedure qualifications per Section IX of the ASME Code of one (1) welded test plate

1/4" through 1 1/8" thick carbon and low alloy steel	90.00
1/4" through 1 1/8" Stainless Steel	100.00
1/4" through 1 1/8" HK, Incoloy, or Hastelloy Type Alloys	115.00
1 1/4" to 2 1/4" thick Carbon & Low Alloy Steel	135.00
1 1/4" to 2 1/4" thick Stainless Steel	155.00
1 1/4" to 2 1/4" thick HK, Incoloy, or Hastelloy Type Alloys	175.00

Weld procedure qualifications per Section IX of the ASME Code of one (1) weld procedure overlay test plate

Plus chemical analysis charge	52.50
Plus sampling charge	12.00

Weld procedure qualification per Section IX of the ASME Code of one (1) welded pipe sample

1/4" through 1 1/8" thick carbon & low alloy steel	95.00
1/4" through 1 1/8" Stainless Steel	105.00
1/4" through 1 1/8" HK, Incoloy, or Hastelloy Type Alloys	120.00
1 1/4" to 2 1/4" thick Carbon & Low Alloy Steel	150.00
1 1/4" to 2 1/4" thick Stainless Steel	160.00
1 1/4" to 2 1/4" thick KH, Incoloy, or Hastelloy Type Alloys	185.00

Weld procedure qualification per ASTM A155 of one (1) Test Plate 45.00

Plus chemical analysis charge

Welder qualification per Section IX of the ASME Code of one (1) welded plate sample 30.00

Machining of one (1) tensile specimen 16.00

Tensile testing of one (1) specimen for tensile strength, Yield Strength and Elongation 11.00

PRICE LIST

Charpy Impact Testing

Prices effective January 1, 1976

(Subject to Change Without Notice)

Testing:

Testing Price Per Specimen

<u>Number of Specimens</u>	<u>Room Temperature</u>	<u>Room Temperature to -90°F</u>	<u>-91°F to -320°F</u>
1 - 3	5.50	8.25	17.50
4 - 24	5.50	6.85	13.75
25 - 57	5.25	6.60	13.25
58 and greater	5.15	6.35	12.95

Machining:

Machining Price Per Specimen

<u>Number of Specimens</u>	<u>Nonferrous, Carbon Steel & Low Alloy Steel</u>	<u>Stainless Steel and Steel over Rc 30</u>
1 - 12	15.50	17.50
13 - 24	14.85	16.75
25 - 57	14.50	16.35
58 and greater	14.30	16.15

General Information:

The standard size Charpy specimen is approximately 1/2 Inch square and 2 1/4 inches long. Charpy testing is normally done in sets of three. The applicable material specification normally specifies the required location of specimens and the orientation relative to the final rolling direction. The final rolling direction should be marked on small pieces of material submitted for testing when the rolling direction will no longer be evident. When flame cutting is used, allow sufficient material for clean up. Welded test plates are prepared in accordance with Paragraph UG-84 of Section VIII of the ASME Code unless otherwise specified. All testing is performed in accordance with SA370 or ASTM E23, as applicable.



MIDSTATES ANALYTICAL LABORATORIES, INC.

5460 South 101st East Avenue

Tulsa, Oklahoma 74145

622-6030

January 1, 1976

Chemical Analysis Rates for Single Determinations

<u>Element</u>	<u>Low Alloy And Carbon Steels</u>	<u>Stainless Steels</u>	<u>CI and DI Foundry Q.C. Only</u>
Carbon	\$ 8.00	\$ 8.25	\$ 4.75
Sulfur	8.25	8.25	4.75
Phosphorous	9.50	9.50	5.75
Silicon	8.75	8.75	5.25
Manganese	8.75	8.75	5.25
Chromium	9.25	9.75	5.50
Nickel	9.25	9.75	5.50
Molybdenum	9.25	9.75	5.50
Copper	11.00	11.50	5.50
Titanium	-	11.50	
Vanadium	11.00	11.50	
Cobalt	11.00	11.50	
Columbium		15.00	
Magnesium			6.50

Al, Cu, Ni, Pb-Sn Alloys - 1 Element \$ 15.00/element
2 - 5 Elements 12.00/element
6 Elements Up 10.00/element

At the option of the laboratory a 5% quantity discount may be allowed when samples are submitted on the same date in groups of five or more and are of a similar type of material, requiring the same analyses. Investigative work on samples of unknown material will normally not be subject to any quantity discount.

Analyses will be performed by atomic absorption or wet chemical procedures at the option of the laboratory. The validity of each analytical procedure will be established by the use of standard reference samples procured from the National Bureau of Standards, the Bureau of Analyzed Samples, or other reputable standard sources.

END

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